2.7: Derivatives and R.O.C.

Recall secants & tangents.

The slope of the tangent line to $f(x)$ @ $x=a$ is:

$$m = \lim_{x \to a} \frac{f(x) - f(a)}{x - a} \quad (1)$$

or

$$m = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h} \quad (2)$$

ex1: find the eqt. of the tangent line to

$f(x) = 2x^3 - 5x$ @ $(-1, 3)$ (use formula 2)

$g(x) = \frac{2x}{(x+1)^2}$ @ $(0,0)$ (use formula 1)

If $s(t)$ is a position fct along a straight line.

$$\text{Ave vel.} = \frac{\text{displacement}}{\text{time}}$$

$$= \frac{s(a+h) - s(a)}{h}$$

and $$v(a) = \lim_{h \to 0} \frac{s(a+h) - s(a)}{h}$$

We call the slope of the tangent line the derivative.

Dfn: The derivative of a fct f at a, denoted $f'(a)$ is

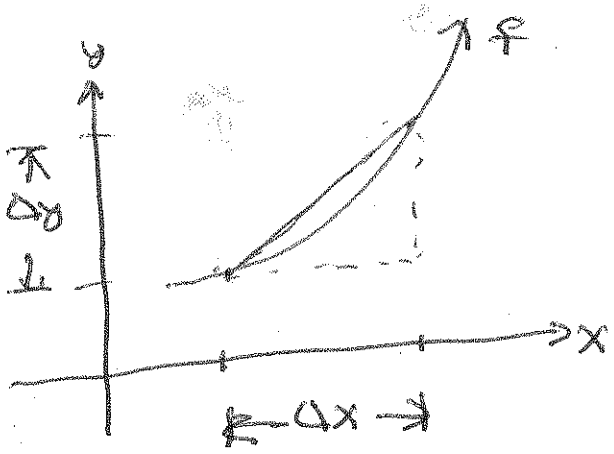
$$f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

if the limit exists.

Alternately, $$f'(a) = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$$

ex2: Find $f'(a)$ if $f(x) = 2x^3 + 3x - 7$

then find the eqt. of the tangent line @ $(1, -2)$.



Ave Roc $= \frac{\Delta y}{\Delta x}$

Inst Roc $= \lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x}$

This is the slope of the tangent line.

Here $f'(a)$ is the inst. Roc of $y = f(x)$ WRT x @ $x = a$.

2.7
3/3

ex3: The quantity (in pounds) of a gourmet ground coffee that is sold by Cutter's Paint at a price of p \$/lb is $Q = f(p)$.

(a) What is the meaning of $f'(8)$

(b) What are the units?

(c) Is $f'(8)$ pos. or neg.?